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Original article

Early active motion protocol following open reduction internal fixation of the scaphoid: A pilot study

Protocole de mobilisation active précoce après réduction à foyer ouvert et fixation interne du scaphoïde : une étude pilote

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Abstract

Scaphoid fractures are common injuries which traditionally have been treated with long periods of immobilization even after open reduction and internal fixation (ORIF). The purpose of this pilot investigation was two-fold: 1) describe a precise postoperative Early Active Motion (EAM) rehabilitation protocol following ORIF of scaphoid fractures and 2) record the outcomes of the EAM protocol. Eight consecutive patients having undergone ORIF of the scaphoid were enrolled in the EAM and followed for a minimum of 1 year. At 12 weeks, Disabilities of the Arm Shoulder and Hand (DASH) score, Mayo Wrist score, and range of motion values were obtained. At 1 year, a telephone survey was conducted and several data points were obtained including DASH and Mayo Wrist score, number of push-ups, satisfaction with surgery and ability to remain on active duty. All 8 patients were male, on active duty, with an average age of 26 years. Two patients used tobacco products and none had major health problems. All patients completed the EAM protocol and obtained CT; all CT exams demonstrated healing at 8 weeks. At 12 weeks postoperatively, the average DASH score was 8.8 ± 16 (range: 0–47.5), Mayo wrist score was 88 ± 10 (range: 75–100) and range of motion nearly symmetrical. At a mean final follow-up of 15.4 months postoperatively, the average DASH score was 1.1 ± 1.7 (Range: 0–4.5), Mayo wrist score was 97.5 ± 4 (range 90–100), average number of push-ups was 57 (40–70) at the prior Army Physical Fitness Test. All patients were satisfied with surgery and all remained on active duty at 1 year. There were no reported complications. The EAM protocol following scaphoid fracture ORIF is safe and effective. The EAM can reliably return patients back to high demand activity earlier than a traditional protocol.

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Keywords: Scaphoid fracture; Rehabilitation protocol; Early range of motion

Résumé

Les fractures du scaphoïde sont des traumatismes courants qui ont été traités traditionnellement par de longues périodes d'immobilisation, même après leur réduction à ciel ouvert et ostéosynthèse interne (ORIF). Le but de cette étude pilote était double : 1) décrire un protocole postopératoire précis de rééducation nommé *early active motion* (EAM) après ORIF d'une fracture du scaphoïde et 2) relever les résultats du protocole EAM. Huit patients consécutifs ayant subi l'ORIF du scaphoïde ont été inclus dans le protocole EAM et ont été suivis sur un minimum d'un an. À 12 semaines, le score Disabilities of the Arm Shoulder and Hand (DASH), le Mayo *wrist score* et les amplitudes articulaires ont été recueillis. À un an, une enquête téléphonique a été conduite pour recueillir plusieurs données, dont les scores DASH et Mayo *wrist*, le nombre de pompes réalisables, la satisfaction relative à la chirurgie et la capacité à effectuer de nouveaux les tâches actives préalables. Les huit patients étaient des hommes en activité, d'un âge moyen de 26 ans. Deux patients utilisaient des produits dérivés du tabac et aucun n'avait de problème majeur de santé. Tous les patients ont subi le protocole EAM complet, un scanner, tous les scanners ont montré la consolidation à huit semaines. À 12 semaines postopératoires, le score DASH moyen était de $8,8 \pm 16$ (de 0 à 47,5), le Mayo *wrist score* était de 88 ± 10 (de 75 à 100) et les

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mobilités étaient presque symétrique avec celles du côté opposé. Au recul moyen de 15,4 mois postopératoires, le score DASH moyen était de $1,1 \pm 1,7$ (de 0 à 4,5), le Mayo wrist score était de $97,5 \pm 4$ (de 90 à 100), le nombre moyen de pompes était 57 (40–70) à l'Army Physical Fitness Test. Tous les patients étaient satisfaits de la chirurgie et tous avaient retrouvé leurs activités antérieures au recul d'un an. Aucune complication n'a été relevée. Le protocole EAM appliqué après l'ORIF d'une fracture du scaphoïde est sûr et efficace. Il permet de façon fiable de rendre les blessés aptes à activités très exigeantes, plus rapidement qu'un protocole traditionnel.

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Mots clés : Fracture du scaphoïde ; Protocole de rééducation ; Mobilisation précoce

1. Introduction

The scaphoid is the most commonly fractured carpal bone, most often fractured at the scaphoid waist [1]. While acute waist fractures may be treated nonoperatively with an expected union rate of 95%, the current nonoperative rehabilitation protocol may involve up to 6 months of cast immobilization [2]. Prolonged immobilization results in significant disuse atrophy, osteopenia, joint contracture and absence from work [3]. Operative treatment is being offered with increasing frequency to more active patients desiring faster return to activities [4]. Early fixation of these fractures has resulted in quicker return to function and military duty [5], less overall cost to society [6–8] and improved functional outcomes [5,9]. One of the primary goals of early fixation is early range of motion; despite this, postoperative immobilization has been recommended for as long as 6 months [10]. There are very limited data to support this lengthy immobilization period.

On account of the potential benefits of fixation and early range of motion, an emphasis on early range of motion postoperatively has arisen [11]. Despite this, no specific protocol has been well-established. In this study, we propose a new rehabilitation protocol, the Early Active Motion Protocol (EAM) which aims to shorten the postoperative rehabilitation protocol and thereby potentially produce faster return to activities, better range of motion and decreased morbidity.

2. Patients and method

2.1. Study development and patient selection

The study received IRB approval (WB#15-22). A retrospective chart review with telephone survey was conducted on all patients having underwent open reduction internal fixation (ORIF) of an acute scaphoid fracture from 2014–2015 with minimum 1 year follow-up. While 16 patients had undergone scaphoid ORIF with the advanced protocol, 8 patients were contacted because of the time points approved by the IRB.

2.2. EAM rehabilitation protocol

Based on the senior author's experience, a rehabilitation protocol was developed following ORIF of the acute scaphoid fracture. This rehabilitation protocol is the standard of care at our institution. A CT-scan was obtained to ensure fracture healing before activity.

The protocol is described in [Appendix A](#). In brief, a patient presenting within 3 weeks of scaphoid fracture to the hand and upper extremity clinic was eligible for participation. The patients were offered fixation or treatment with a short arm cast. All operative treatment included open approach to the scaphoid and fixation was achieved with a tapered, variable pitch, headless compression screw. If the patient selected fixation, he was then allowed to select the EAM protocol, which is the standard of care at our facility, or the traditional protocol.

Following fixation, those in the EAM protocol were seen in the occupational therapy clinic first at the 2-week point. Gentle range of motion of the fingers was permitted while the patient remained in a thumb spica splint. No radiographs were obtained. At 2 weeks, the patient was transitioned into a removable splint that was worn outside of therapy. At the 4 and 6 week points, AP and lateral radiographs of the wrist were obtained. A CT-scan was obtained at 8 weeks. If the bone had healed, the patient could discontinue immobilization and advance with light function. However, if the bone was not healed on CT, the patient was immobilized for another 6 weeks. Function was not advanced until the bone was healed on CT-scan.

2.3. Patients

The first 8 consecutive patients with scaphoid fractures treated with ORIF were included. All wished to participate in the EAM protocol, were followed for a minimum of 1 year, and all completed therapy. Inclusion criteria were:

- consenting adult for fracture fixation and EAM protocol;
- presenting with scaphoid fracture < 3 weeks from injury;
- successful fixation.

The exclusion criteria were:

- incomplete EAM participation;
- < 1 year follow-up.

At 1-year postoperatively, a telephone survey was conducted. The short questionnaire asked how many push-ups the patient was able to do, if they were retained on active duty and if they were satisfied with surgery. Disabilities of the Army Hand and Shoulder (DASH) and Mayo Wrist scores were also obtained. Averages and standard deviations of these variables were determined.

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